

BASIS FOR THE AMENDMENT

The claims have been amended in a manner so as to overcome the Examiner's objections and rejection under the second paragraph of 35 U.S.C. §112, such also necessitating the addition of Claims 19-24 directed to particular embodiments of the original claims. Basis for the added limitation is at page 5, lines 1-11 of the specification.

Added Claims 25-48 parallel Claims 1-24, being further limited to the necessary heat being supplied solely by the one or more submerged burner(s).

REMARKS

Favorable reconsideration of this application is requested.

Claims 1-48 are in the case.

Claims 1, 3-6, 8, 13 and 18 stand rejected under 35 U.S.C. §102(b) or §103(a) as being unpatentable over Cornelius, also in further view of Carroll et al.

Claim 2 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Cornelius in view of Carroll et al.

Claim 7 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Cornelius in further view of Carroll et al. and Delwel et al.

Claims 9-12 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Cornelius in view of Jeanvoine et al.

Claims 14-17 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Cornelius in view of Carroll et al.

The interview kindly granted by the Examiner, Mr. Colaianni, on November 13, 2002 is herewith acknowledged with appreciation. It served to materially advance the prosecution of the case by clarifying the issue. Specifically, for reasons as urged at said interview and in

view of the amendment to the claims, the Examiner states that such amended claims would appear to define over the art and that further consideration will be given upon formal submission of a response.

The invention relates to a process for manufacturing compounds based on one or more silicates of alkali metals and/or alkaline-earth metals and/or rare earths, optionally in the form of mixed silicates which combine at least two of these elements, by the conversion of silica and of halides or sulfates or nitrates, of the said alkali metals and/or of the said rare earth and/or of the said alkaline-earth metals said conversion taking place in a mass containing molten materials and containing the products undergoing the reaction of conversion and the formed products, wherein the heat necessary for this conversion is supplied at least partly, or solely by one or more submerged burners, they causing turbulence within said mass, as well as to an apparatus for carrying out such a process.

Features now specifically defined in the claims not disclosed by the prior art are that the conversion takes place in a mass containing molten materials and containing the products undergoing the reaction of conversion and the formed components and/or that the heat necessary for the conversion is supplied solely by one or more submerged burners. Unobviously superior results are obtained due to these claimed features, as so discussed and shown in the specification.

The relevant disclosure of Cornelius is at page 3, lines 17-21, i.e.:

The silicate layer heated by the electrodes preferably acts to heat the furnace by radiation, but if desired supplementary heating may be used, e.g. a gas or oil burner.

The electrodes in the structure of Cornelius obviously are not equivalents to the claimed submerged burners, they not providing for the advantageous results obviating the

processing problems heretofore encountered, as note page 4, lines 8-18 of the specification;
i.e.:

Hitherto, this reaction has caused considerable processing problems associated with difficulties in producing an intimate mixture of the reactants and in ensuring that these are replenished during manufacture, also associated with difficulties in discharging HCl (or H₂SO₄) without it reacting again with the silicate formed, in extracting the silicate and in being able to supply sufficient thermal energy.

The use of submerged burners for supplying this thermal energy solves at the same time most of these difficulties.

The Examiner contends that the supplementary heating taught by Cornelius in the form of gas or oil burners would have to be submerged and thus would inherently produce the claimed results.

Such reasoning manifestly is not warranted for the following reasons. It is not apparent why such supplementary heat source would have to be submerged. The electrodes, the main source of heat and being submerged, are not taught as being replaced by the supplementary burners, nor do they cause turbulence. Further, such gas or oil burners are not disclosed as being the sole heating means, they being taught only as supplementary heating means. Claims 25-48, contrariwise, require heating solely by submerged burners.

Further, it is pointed out that submerged burners have only recently become available and known, as note column 2, lines 16-17 of Carroll et al. Cornelius in 1939 could thus not possibly have contemplated, nor being suggestive of, submerged burners which have become available about the time of the invention of Carroll et al., i.e. in 1998.

Further, the process of Cornelius is predicated on direct contact between H₂O gas with solid particles of silicon dioxide and sodium chloride. In order to accomplish this, the solid materials, i.e. silica and sodium chloride, are arranged as a membrane permeable to the gas. Note page 1, left-hand column, lines 20-26 and right-hand column, lines 44-50. Sodium

silicate as so prepared flows away from the charge and falls into the bath. Sodium chloride may be floated on this bath in order to vaporize it. Note page 2, right-hand column, lines 1-5. A fresh charge is supplied proportionate to the silicate which melts away (page 2, right-hand column, lines 40-42). The bath, in fact, thus is pure molten sodium silicate covering the electrodes and not, as so specifically defined in the claims, a mixture of the reacting silica halides of alkali metals and water and of the final product, i.e. the silicate of alkali metal.

In Cornelius, the silicate forms the membrane, flows as a liquid into the bath, and the electrodes serve only to maintain the molten state of the silicate in order to allow it to flow and to be recovered. Some salt may float in molten conditions above the silicate but is gasified, as note page 3, left-hand column, lines 37-41. Consequently in Cornelius:

1. A chemical reaction takes place only in the membrane and not in the bath.
2. The molten bath contains no silica and no water.
3. It is essential that sodium chloride, if present in molten form, remains at the surface so that it can be easily vaporized.
4. The starting solids must be separated from the final liquid product, i.e. the silicate, in order to allow the chemical reaction to proceed and in order to separate the final product from the reactants, i.e. the silicate being removed continuously from the furnace (page 3, right-hand column, lines 19-22).

Cornelius thus, in fact, teaches away from the claimed invention wherein the reaction mixture comprises a molten material containing all of the products undergoing reaction of conversion and the formed compounds, turbulence being effected by the submerged burners. Cornelius teaches transforming the reactant products into a skeleton (page 2, left-hand column, line 8) which is fixed and cannot be subjected to turbulence. Furthermore, Cornelius

teaches a layer of sodium chloride floating on the surface, thus being contrary to the claimed process wherein all components are mixed.

With regard to Carroll et al, the secondary reference also relied upon by the Examiner, it manifestly does not cure the basic deficiencies pointed out and discussed above with regard to Cornelius. Similarly, here, any submerged burner present in their system do not cause conversion to take place in a mass containing materials and containing the products undergoing the reaction of conversion and formed compounds, as well as not being the sole source of heat, the system of Carroll et al relying additionally on heat generated by various heat exchangers. Accordingly, even the combined teachings of these reference do not make obvious Applicants' discovery.

Delwel et al and Jeanvoine et al, the secondary references, are relied upon only for asserted obviousness of subsidiary claimed features. As such, they manifestly do not cure the basic deficiencies of the other references combined with to make obvious Applicants' discovery.

Withdrawal of the rejection of the claims under 35 U.S.C. §102 and §103 thus is requested.

With regard to the rejection of the claims under the second paragraph of 35 U.S.C. §112 and objections made thereto, the claims have been amended in a manner believed to obviate this rejection and objection, their withdrawal thus being requested.

Should any further amendments to the claims be considered necessary by the Examiner, he is requested to contact the undersigned by telephone so that mutually agreeable language may be arrived at.

It is submitted that this application is now in condition for allowance which is solicited.

Respectfully submitted,

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Marked-Up Copy

Serial No: 09/646,880

Amendment Filed: HERewith

IN THE CLAIMS

--1. (Amended) Process for manufacturing compounds based on one or more silicates of alkali metals [such as Na, K] and/or alkaline-earth metals [such as Ca, Mg] and/or rare earths [such as Ce], optionally in the form of mixed silicates which combine at least two of these elements, by the conversion of silica and of halides or sulfates or nitrates[, especially of one or more chlorides,] of the said alkali metals and/or of the said rare earth and/or of the said alkaline-earth metals, said conversion taking place in a mass containing molten materials and containing the products undergoing the reaction of conversion and the formed products, [such as NaCl, KCl or CeCl₄, characterized in that] wherein the heat necessary for this conversion is supplied[, at least partly,] by one or more submerged burners.

2. (Amended) Process according to Claim 1, [characterized in that] wherein the submerged burner(s) is(are) fed with an oxidizer in the form of air, oxygen-enriched air or oxygen.

3. (Amended) Process according to [either of the preceding claims characterized in that] Claim 1, wherein the submerged burner (s) is (are) fed with a fuel in the form of natural gas, fuel oil or hydrogen and/or in that solid-type or liquid type fuel[, especially fuel containing carbon materials based on polymers, possibly chlorinated polymers, or based on coal,] is supplied [near] to the said burner(s).

4. (Amended) Process according to [one of the preceding claim, characterized in that] Claim 1, wherein the combustion created by the submerged burner(s) at least partly ensures stirring of the silica and of the halide(s).

5. (Amended) Process according to [one of the preceding claims, characterized in that] Claim 1, wherein the combustion created by the submerged burner (s) at least partly generates the water needed for the conversion.

6. (Amended) Process according to [one of the preceding claims, characterized in that] Claim 1, wherein the conversion also generates halogenated derivatives[, especially utilizable chlorinated derivatives such as HCl or Cl₂ or H₂SO₄.

7. (Amended) Process according to [one of the preceding claims, characterized in that] Claim 1, wherein the silicate(s) formed is(are) treated in order to make it(them) compatible with use as one or more vitrifiable batch materials for a glass furnace[, the treatment comprising, in particular, a granulation step].

8. (Amended) Process according to [one of Claims 1 to 6, characterized in that] Claim 1, wherein the silicate(s) formed is(are) fed hot into a glass furnace.

9. (Amended) Apparatus for carrying out the process according to [one of the preceding claims, characterized in that] Claim 1, comprising [it comprises] at least one reactor (1) equipped with one or more submerged burners (3) and at least one means for introducing silica and/or the halide(s) or nitrates or sulfates and [optionnaly] optionally liquid type or solid type combustibles, below the level of the materials undergoing melting[, especially in the form of one or more feed-screw batch chargers (6)].

10. (Amended) Apparatus according to Claim 9, [characterized in that] wherein the walls (2, 4) of the reactor (1)[, especially those intended to be in contact with the various reactants/reaction products involved in the conversion,] are provided with refractory

materials[, for example of the electrocast type] or with refractory materials lined with a metal lining of the titanium or zirconium type or are based on this type of metal[, and are preferably combined, at least in the case of the side walls (4), with a cooling system using the circulation of fluid of the water type].

11. (Amended) Apparatus according to Claim 9 [or Claim 10, characterized in that] , wherein the walls of the reactor (1) define an approximately cubic, parallelepipedal or cylindrical cavity.

12. (Amended) Apparatus according to [one of Claims 9 to 11, characterized in that] Claim 9, wherein the reactor (1) is equipped with means for treating [the] chlorinated effluents[, especially means for recovering HCl or Cl₂] or H₂SO₄ or for neutralizing HCl and/or means for separating solid particles[, for example those based on a metal chloride,] from the gaseous effluents.

13. (Amended) [Use of the] The process according to [one of Claims 1 to 8 or of the apparatus according to one of Claims 9 to 12] Claim 1 for preparing vitrifiable batch materials for the manufacture of glass.

14. (Amended) [Use of the] The process according to [one of Claims 1 to 8 or of the apparatus according to one of Claims 9 to 12] Claim 1 for preparing raw materials[, especially sodium silicate Na₂SiO₃,] for the manufacture of detergents.

15. (Amended) [Use of the] The process according to [one of Claims 1 to 8 or of the apparatus according to one of Claims 9 to 12] Claim 1 for preparing [raw materials, especially] sodium silicate [Na₂SiO₃, for the manufacture of precipitated silica, more particularly form silica and sodium sulfate].

16. (Amended) [Use of the] The process according to [any of claims 1 to 8 or of the apparatus according to any of claims 9 to 12] Claim 1 for the vitrification of wastes[,

notably] of the organo-chloride type[, preferably by conversion of silica and of raw material carrying alkaline-earth metals at least].

17. (Amended) [Use of the] The process according to [any of claims 1 to 8 or of the apparatus according to any of claims 9 to 12] Claim 1 for the treatment of sand [polluted] polluted by fuel or similar hydrocarbon[ate] compounds[, preferably by conversion of silica and of raw material carrying alkaline-earth metals at least].

18. (Amended) Process for obtaining glass containing silica and alkali-metal oxides, of the Na_2O or K_2O type and/or alkaline-earth metal oxides of the CaO or MgO type and/or rare-earth oxides of the CeO_2 type, [by] comprising melting vitrifiable materials in which the heat needed for the said melting comes at least partly from one or more [the] submerged burner(s), causing turbulence within said vitrifiable material, [characterized in that] wherein the vitrifiable materials [containing] comprises alkali metals[, of the Na or K type,] or rare earths[, of the Ce type] or alkaline-earth metals, [are] at least partly in the form of halides, [especially chlorides,] of the said elements[, such as VCl , KCl or CeCl_4].--

Claims 19-48 (New).